INTERNATIONAL LANDSAT SALES

A summary of worldwide sales of Landsat data products was compiled and presented at the third annual Landsat User Services/Data Management Workshop (US/DMW) in Canberra, Australia, May 18-19, 1981. The US/DMW has been renamed the Data Distribution Working Group and is now recognized as a formal subgroup of the Landsat Ground Station Operators Working Group (LGSOWG). The sales statistics were gathered in response to an action item identified at a previous meeting and are synopsized below.

SALES BY MONETARY VALUE

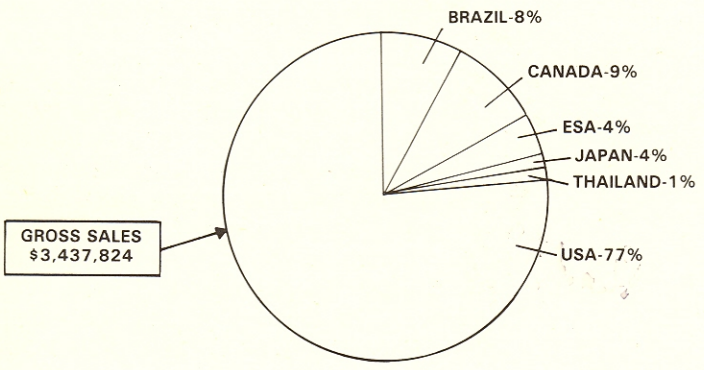
Worldwide gross sales (in U.S. dollars) for Landsat data in 1979 totaled $3,437,824. Of this amount, photographic products accounted for $2,496,367, or 73 percent, and computer-compatible tapes (CCT's) totaled $941,457, or 27 percent.

In 1980, data sales increased by 22 percent to $4,201,015. Sales of photographic products in 1980 totaled $2,844,306 (68 percent), and CCT sales totaled $1,356,709 (32 percent).

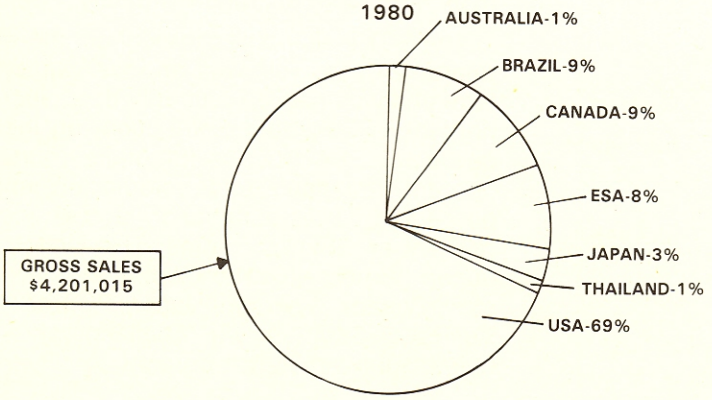
The major changes from 1979 to 1980 were caused by several factors. Australia started product distribution in late 1980, and the European Space Agency (ESA) sales more than doubled in 1980 compared to 1979. Japanese distribution also increased significantly, and U.S. CCT demand increased by 35 percent. Although the Earth Resources Observation Systems (EROS) Data Center (EDC) is the primary U.S. production and

Landsat Worldwide Sales (in Dollars)

1979



1980



Landsat Data Users NOTES

ISSUE NO. 19
JULY 1981

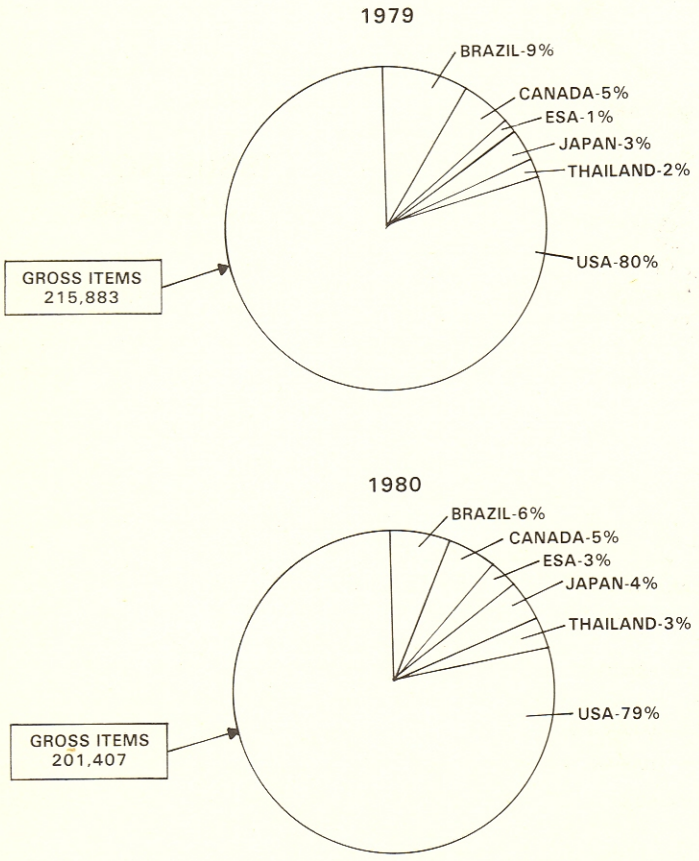
U.S. GEOLOGICAL SURVEY
EROS DATA CENTER
Sioux Falls, S. Dak. 57198

distribution facility for Landsat data, The National Aeronautics and Space Administration (NASA) Goddard Space Flight Center (GSFC) provides large data volumes to a few U.S. Federal agencies engaged in agricultural applications.

In 1979, the United States had the largest income from the sale of Landsat products, accounting for 77 percent of all sales worldwide. It was followed by Canada with 9 percent, Brazil with 8 percent, ESA at 4 percent, and Japan and Thailand at 1 percent each. In 1980, the United States had 69 percent of worldwide income, followed by Canada and Brazil at 9 percent each, ESA with 8 percent, Japan with 3 percent, and Australia, Thailand, South Africa, and India at approximately 1 percent each.

These summaries are based on the conversion of photographic frames and CCT scenes distributed by each country to U.S. dollar values using the prevailing data prices of each country in 1979 and 1980. An average currency conversion rate for each country was used for each year. Because of the accounting methods used by some countries and varying currency conversion rates, some discrepancies may be present in the total sales figures.

Landsat Worldwide Sales of Items



SALES BY ITEM COUNT

A count of the number of photographic products and CCT's sold is probably more significant than a summary of dollar amounts. To determine a representative indication of the total product volume handled worldwide, both revenue-producing (reimbursable) and nonrevenue-producing (nonreimbursable) deliveries were tabulated. In 1979, the gross number of items distributed amounted to 215,883. Of this total, 201,495 were photographic products and 14,388 were CCT's. The United States distributed 80 percent of all products, and Brazil distributed 9 percent. These countries were followed by Canada with 5 percent, Japan with 3 percent, Thailand with 2 percent, and ESA with 1 percent.

Of the 201,495 photographic frames produced in 1979, the United States produced 79 percent, Brazil produced 10 percent, and Canada followed with 5 percent. Japan had 3 percent, Thailand 2 percent, and ESA 1 percent. Digital data produced in 1979 amounted to 14,388 CCT's, of which 89 percent were from the United States, 6 percent were from ESA, 2 percent were from Japan and Canada, each, and 1 percent came from Brazil and Thailand, each.

In 1980, 201,407 photographic frames and CCT's were distributed worldwide. By item count, the distribution was as follows: United States, 79 percent; Brazil, 6 percent; Canada, 5 percent; Japan, 4 percent; ESA and Thailand, 3 percent each; South Africa, India, and Australia, approximately 1 percent.

Photographic frames produced in 1980 totaled 179,693 compared to the 201, 495 produced in 1979. The major changes from 1979 to 1980 were caused by the following factors: Australia started production in late 1980, Brazilian frame sales decreased by 40 percent, ESA's volume was up by 125 percent, Japan's distribution was up by 33 percent, and GSFC's distribution to two U.S. Federal agencies was down 57 percent. The countries distributed the photographic data as follows: United States, 78 percent; Brazil, 6 percent; Canada and Japan, each 5 percent; Thailand and ESA, each 3 percent; South Africa, India, and Australia, approximately 1 percent.

The CCT's distributed throughout the world in 1980 totaled 21,714. This was an increase over the 1979 total and was caused primarily by an increase of 203 percent in Canada's distribution, an increase of 37 percent in ESA's CCT distribution, an increase of 41 percent in Japan's total volume, an increase of 38 percent in EDC's distribution, and an increase of 52 percent in GSFC's volume. The United States produced 88 percent of the world's CCT's; ESA, 6 percent; Canada, 3 percent; Japan, 2 percent; and Brazil, Australia, South Africa, Thailand, and India, combined, approximately 1 percent.

In the above item counts, a photographic item is counted as one photographic frame, on either film or paper, of a single band of multispectral scanner (MSS) or of a single subscene of return beam vidicon (RBV) data. CCT's were counted as one CCT for an MSS scene and one CCT for an RBV subscene.

REMARKS

No significant seasonal trends for either photographic or CCT products were observed in the calculations. However, some differences in the amount of black-and-white imagery sold, relative to the amount of color imagery sold, were noted. In 1980, Canada, ESA, and Japan sold twice as many black-and-white products as they did the year before.

Most distributors of Landsat data do not foresee any significant growth in demand in the near future. It is believed, however, that requests for data will increase at a 10-percent annual rate with the launch of Landsat D. Much will depend on prices, continuity of data, government funding, cost of equipment, and other factors.

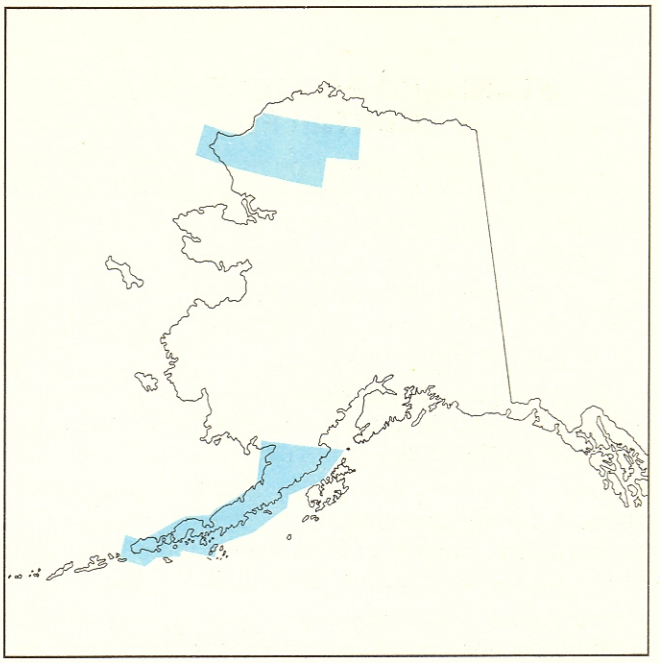
It is important to note that the Landsat program cannot be measured wholly in terms of data sales. The specific *uses* made of the data by resource managers and governments around the world will be the only true indicators of the ultimate value of the program.

RECENT ACQUISITIONS OF AERIAL PHOTOGRAPHY BY EDC

In addition to the large number of satellite images that are accessible in EDC's main image file, a significant quantity of aerial photographs are received on a regular basis. These photographs are produced under both ongoing and completed projects of the U.S. Geological Survey's National Mapping Division, NASA, and other Government agencies. Comprised of a wide variety of scales, film types, and acquisition formats, most of the satellite images and aerial photographs are eventually made retrievable via computerized inquiry. Microform reference aids are also developed for much of the data to assist users in manually selecting those frames that best meet their needs.

EDC's most recent acquisitions of aerial images have included radar images of certain parts of Alaska, color and color-infrared aerial photographs over Wyoming, and additional National High-Altitude Photography (NHAP) program photographs of several areas of the United States.

The radar images are presently being acquired by the U.S. Geological Survey over two large areas in Alaska. Radar images, because they are unaffected by cloud cover and can emphasize certain features in terrain, may prove useful for geologic research in these areas. The majority of the side-looking airborne radar (SLAR) data were acquired during the summer and fall of 1980; the remaining areas are to be covered this summer (see accompanying map). The images will be referenced on microfiche and made retrievable by geographic region.



Side-looking airborne radar coverage of the State of Alaska.

In another project conducted by the Bureau of Land Management (BLM) last year, color and color-infrared photographs of approximately 20 percent of Wyoming were acquired. The 1:24,000-scale photographs are of excellent quality. Synchronous exposures were taken by a dual camera system, enabling the user to compare natural-color and color-infrared photographs of the same land area. These 9-inch photographs can be retreived from the EDC data base on the basis of geographic region.

Photographs also continue to be received from the NHAP program. Past issues of the Landsat NOTES have provided updates on the receipt of data from this program. As of June 1, 26,637 frames of NHAP color-infrared photography and 43,021 frames of black-and-white photography had been cataloged and entered into the EDC data base. This ongoing program will eventually provide complete coverage of the contiguous United States, establishing an up-to-date aerial photographic data base of the Nation. The computerized data base records of NHAP coverage are supplemented by a manual reference system in which the specific locations of every roll and frame are shown graphically on microfiche. NHAP index and status maps are also available on microfiche.

Further information regarding the availability of these products and their reference systems can be obtained by contacting the User Services Section, U.S. Geological Survey, EROS Data Center, Sioux Falls, SD 57198, telephone: (605)594-6151.

STANDARD PRODUCT LINES CURTAILED

As of July 1, 1981, paper prints from the following types of master reproducible images were no longer available as standard products from EDC:

- 70-mm aircraft photographs
- 127-mm aircraft photographs
- All manned-spacecraft photographs (Skylab, Apollo, and Gemini missions).

This change involves paper products only; contact-size positive and negative film products continue to be available as they have in the past.

Users can still order paper prints of any of the above types of photography, but these requests will be handled as custom orders. A price three times that of the standard product price will be charged.

Any questions concerning the availability of specific images can be directed to the User Services Section, U.S. Geological Survey, EROS Data Center, Sioux Falls, SD 57198, telephone: (605)594-6151.

PRICE INCREASES

Effective October 1, 1981, EDC plans to raise its prices on almost all data products, including those from Landsat. The increases reflect the higher cost of supplies, materials, and labor needed to reproduce remotely sensed data. Prices were last changed in January 1977.

The new prices for Landsat photographic products are summarized in the table on this page.

In addition, the price of Landsat digital data in the form of CCT's is being increased. An MSS CCT set (one scene consisting of all four bands) will cost $300 as of October 1. This will be an increase of $100 from the $200 being charged currently. The price of an RBV CCT (one subscene) will similarly increase from $200 to $300.

Aerial photographic product prices, although too numerous to list here, will be boosted also. Many prices will increase as much as 50 to 100 percent.

The U.S. Geological Survey is required to recover the cost of reproduction when furnishing image data to the public. If you have any questions concerning the recent price increases, please contact the User Services Section, U.S. Geological Survey, EROS Data Center, Sioux Falls, SD 57198, telephone: (605)594-6151.

STREAMFLOW ESTIMATION IN SURFACE-MINED AREAS

EDC recently completed a cooperative demonstration project with the U.S. Geological Survey Water Resources Division, Tennessee District. The purpose of the study was to test the feasibility of improving the regression equations used to estimate streamflow in areas affected by coal surface mining in the Cumberland Plateau in Tennessee. Land cover data derived from digital image processing of Landsat spectral data were used to improve the multiple linear regression analysis. In Tennessee, streamflow data are needed by regulatory agencies to assess plans designed to mitigate the impacts of coal surface mining on streamflow and water quality.

The general objective of the streamflow data program in Tennessee is to provide users with water information at any site in any stream. In order to satisfy this need, streamflow information for imaged sites can be derived by correlation with gaged sites having similar climate, physiography, and geology. Streamflow characteristics are estimated by determining basin characteristics of the ungaged sites. Basin characteristics are statistically derived (transferred) by regression analysis of a single statistical measure of streamflow, such as mean annual flow, against an array of physiographic and climatic characteristics for the corresponding gaged basin within a selected region. (The independent variables are known as basin characteristics, and the dependent variable is referred to as a streamflow characteristic.) Equations derived from this procedure enable the Water Resources Division to estimate streamflow characteristics at any ungaged site by determining the basin characteristics for the site. Previous studies showed that land use data derived

SUMMARY OF LANDSAT PRODUCT PRICES

			Black & White Unit Price		Color Unit Price	
Image Size	Scale	Format	Current	As of Oct. 1	Current	As of Oct. 1
56 mm	1:3,369,000	Film Pos.	$ 8	$ 8	N/A	N/A
56 mm	1:3,369,000	Film Neg.	10	10	N/A	N/A
185 mm	1:1,000,000	Film Pos.	10	10	$15	$15
185 mm	1:1,000,000	Film Neg.	10	12	N/A	N/A
185 mm	1:1,000,000	Paper	8	10	$12	$15
370 mm	1:500,000	Paper	12	20	25	35
742 mm	1:250,000	Paper	20	35	50	70

from aerial photographs, as well as land cover data derived from Landsat images, could substantially improve the accuracy of some equations used in Delaware, eastern Maryland, and Virginia.

In the Tennessee study, the accuracy of equations based on basin characteristics derived from maps and climatological records (the control group) was compared to the accuracy of equations based on basin characteristics derived from digital processing of Landsat spectral data as well as maps and climatological records (the experimental group). The Landsat data were analyzed digitally in the EDC Data Analysis Laboratory. The multiple linear regressions were performed using a computer at the U.S. Geological Survey in Reston, Va.

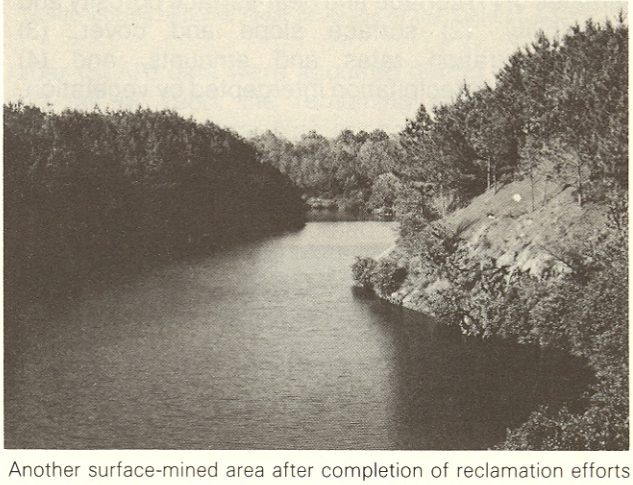
Landsat data of the study area were classified and categorized using a combination of supervised and unsupervised techniques. The classification and analysis (which resulted in eight resource types) were performed in six phases: preprocessing, stratification, classification, clustering, postclassification processing, and product generation. Products included a geometrically corrected image, a classified image of the 34,000-km² project area, and several resource class summaries. Landsat radiance statistics, basin area estimates, and area measurements were also derived for each of the 42 drainage basins within the study area. The spectrally classified data were used to establish basin characteristics in the experimental group of regression equations.

Initial project work included clustering Landsat data using an unsupervised algorithm to derive 39 spectral cover types. The training areas were then geometrically corrected, and map overlays were generated on a line printer at 1:24,000 scale. These map overlays were subsequently checked in the field to determine hydrologically significant land cover categories.

Portions of two Landsat scenes were then mosaicked, skewed for earth rotation, and destriped. Concurrent project work included digitizing data on the 42 drainage basins within the project area. Strata masks and tabular summaries, including area estimates and Landsat radiance values, were then derived for the individual basins. Additional work included digitization of project area boundaries and latitude and longitude coordinates.

After field checks, the initial 39 spectral classes were modified, color-coded, and assigned to eight resource types. The entire 34,000-km² project area was then classified into the following categories: (1) deciduous forest (well lit), (2) deciduous forest (in shadow), (3) conifer forest, (4) mixed forest, (5) covered ground, (6) bare ground, (7) coal spoil, and (8) water.

Surface-mined area currently undergoing reclamation.



Another surface-mined area after completion of reclamation efforts. Outcrops of coal on the right occur naturally and are not the result of man's activity.

Boundaries of the 42 drainage basins and a latitude and longitude coordinate grid were added to the final classified image. With the addition of a legend, scale, and project boundaries, the final product was complete. The information on basin characteristics was also compiled.

No substantial difference in accuracy was found between equations based on basin characteristics derived from maps (control group) and equations based on basin characteristics derived from Landsat data (experimental group) for the Cumberland Plateau of Tennessee. The results of this experiment show (with the exception of low-flow estimates) that characteristics of the drainage area account for more than 90 percent of the variance in all streamflow characteristics in both groups of equations. Of the equations in the experimental group, 17 out of the 39 used were different from the corresponding control group equations; 5 of these had no counterpart in the

control group, another 5 equations were not measurably different, and 7 were slightly more accurate.

Landsat scenes acquired in April were used to derive the land cover type in this study. Better classification accuracy and additional cover classes probably could have been obtained by registering a sequence of Landsat scenes acquired throughout the growing season. Optimal results cannot be obtained from a single scene that shows spectral reflectance at one time only.

More research is needed on the relationship between landscape features (conducive to measurement by remote sensing) and streamflow characteristics. This relationship is particularly important in estimating low streamflow rates. Present equations, based on map and climatic data, introduce large errors into the estimates. Remote sensing measurements and surrogates are needed for better estimates of (1) surface and near-surface porosity and permeability, (2) surface slope and cover, (3) evapotranspiration rates and amounts, and (4) percentage of precipitation intercepted by vegetation.

IMAGE PROCESSING CONFERENCE

Final plans have been made for a workshop on microprocessor-based image processing systems to be held at EDC on October 22-23, 1981. The objective of the workshop is to provide for an exchange of information in the state-of-the-art in microprocessor image processing and to provide a forum for public review and discussion of the future direction of this technology. Topics to be covered will include:

- Functional specifications of remote image processing stations
- Functional specifications of host systems
- Overall systems concepts
- Software availability
- Hardware standards
- Communications protocols

For further information about this workshop, write the EROS Information Specialist, U.S. Geological Survey, EROS Data Center, Sioux Falls, SD 57198. Individuals and organizations selected to attend or make presentations will be notified by September 18.

NEW PUBLICATION SERIES

The Remote Sensing Section at the University of Zurich, Switzerland, recently announced a new remote sensing publications series. Four volumes have been published to date. They are "Snow Surveys from Earth Resources Satellites in the Swiss Alps," "Bibliography of Snow Mapping with Remote Sensing Techniques," *"Vom Farbigen Luftbild zur Computerkarte der Landnutzung"* (translation: "From Color Aerial Photographs to Computerized Land Use Maps"), and "Soil Moisture Detection with Microwave and Thermal Infrared Sensors." The publications may be purchased separately or ordered at a subscription rate. Contact the Department of Geography, Remote Sensing Section, University of Zurich, P.O. Box CH-8033, Zurich, Switzerland.

SYMPOSIA

A 1-week symposium/workshop, which will provide inventory specialists with methods for producing reliable inventories and maps of resources, will take place August 9-14, 1981, in Orono, Maine. Entitled *In-Place Resource Inventories: Principles and Practices,* the workshop will include discussions of inventorying, classifying, mapping, sampling, and managing resource data. Further information can be obtained from the Conferences and Institutes Division, 128 College Avenue, University of Maine at Orono, Orono, ME 04469.

The *Second Australasian Remote Sensing Conference* will be held at the Australian National University in Canberra, August 31 to September 4, 1981. This conference will focus on the application of Landsat data to problems within the Australasian region, with an emphasis on current achievements. An opportunity to inspect the newly opened processing facility of the Australian Landsat Station will be provided. Detailed information can be obtained by writing Landsat 81, Australian Academy of Science, P.O. Box 783, Canberra City, A.C.T. 2601, Australia.

The *7th Canadian Symposium on Remote Sensing* will be held September 8-11, 1981, in Winnipeg, Manitoba. The theme this year is "Down to Earth Management." Sponsored by the Canadian Remote Sensing Society of the Canadian Aeronautics and Space Institute, the symposium will feature recent developments in data sensors, acquisition, processing, and analysis. Special emphasis will be placed on the application of information obtained from remotely sensed data to the management of natural resources. Further information can be obtained from Mr. G. Spafford, Technical Program, Manitoba Remote Sensing Centre, 1007 Century Street, Winnipeg, Manitoba R3H OW4.

A conference entitled *Remote Sensing of Arid and Semi-Arid Lands* will be held November 3-9, 1981, in Cairo, Egypt. The conference will be jointly organized by the Environmental Research Institute of Michigan and the Egyptian Remote Sensing Center of the Academy of Scientific Research and Technology. For further information, readers are invited to contact Dr. Jerald J. Cook, Environmental Research Institute of Michigan, P.O. Box 8618, Ann Arbor, MI 48107, telephone: (313)994-1200.

EDC TRAINING SCHEDULE

The EROS Data Center's Applications Branch staff will conduct or participate in several training courses and workshops in the coming months.

Aug. 24 - 28 *Remote Sensing for Geology* (Anchorage, Alaska) Open enrollment. Contact: David M. Carneggie, USGS/EROS Field Office, 218 'E' Street, Anchorage, AK 99401, telephone: (907)271-4065.

Aug. 31 - Oct. 2 *International Remote Sensing Workshop: Applications in Vegetation Assessment and Land-Use Planning* (Sioux Falls, S. Dak.) Open to non-U.S. scientists. Contact: Office of International Geology, U.S. Geological Survey, National Center, Mail Stop 917, Reston, VA 22092, telephone: (703)860-6418.

Oct. 26 - 30 *Applications of Remote Sensing in Geology /Hydrology* (Sioux Falls, S. Dak.) Open enrollment. Contact: Branch of Applications, EROS Data Center, Sioux Falls, SD 57198, telephone: (605)594-6114.

Nov. 16 - 20 *Advanced Geological Workshop* (Sioux Falls, S. Dak.) Open enrollment. Contact: Branch of Applications, EROS Data Center, Sioux Falls, SD 57198, telephone: (605)594-6114.

ADDITIONAL TRAINING IN REMOTE SENSING

Aug. 17 - Sept. 11 *Theory and Applications of Remote Sensing* (Fort Clayton, Panama) Contact: Merritt J. Bender, DMA IAGS Cartographic School, APO Miami 34004.

Aug. 25 *Postgraduate Diploma Programme in Remote Sensing* (Tamil Nadu, India) Duration — 1 year. Contact: Prof. R. Palanivelu, Head, Division of Photogrammetry and Remote Sensing, Pararignar Anna University of Technology, Madras, India.

Sept. 8 - 10 *International Colloquium on Spectral Signatures of Objects in Remote Sensing* (Avignon, France) Contact: G. Guyot/I.N.R.A., Station de Beoclimatologie, B.P. 91, 84140 Montfavet, France.

Sept. 14 - 25 *Applied Remote Sensing for Studies in Forestry and Soils* (Fort Clayton, Panama) Contact: Merritt J. Bender, DMA IAGS Cartographic School, APO Miami 34004.

Sept. 14 - Oct. 2 *Remote Sensing for Land use Inventories* (Ispra, Italy) Contact: ISPRA-Courses, Centro Comune di Ricerca, 21020 Ispra (Varese), Italy, telephone: 0332/780131.

Sept. 14 - Dec. 11 *Remote Sensing of Coastal Environment and Marine Resources* (Newark, Del.) Contact: Dr. V. Klemas, Center for Remote Sensing, College of Marine Studies, University of Delaware, Newark, DE 19711, telephone: (302)738-2336.

Sept. 21 - Oct. 9 *Remote Sensing for Agriculture and Land Use Programmes* (Nairobi, Kenya). Contact: Training Programme Manager, Regional Remote Sensing Facility, P.O. Box 18332, Nairobi, Kenya.

Sept. 28 - Oct. 9 *Digital Analysis of Landsat Imagery* (Fort Clayton, Panama) Contact: Merritt J. Bender, DMA IAGS Cartographic School, APO Miami 34004.

Oct. 5 - Nov. 6 *Advanced Training in Land Use Planning and Environmental Applications* (Flagstaff, Ariz.) Open to non-U.S. scientists. Contact: Office of International Geology, U.S. Geological Survey, National Center, Mail Stop 917, Reston, VA 22092, telephone: (703)860-6418.

Oct. 13 - 24 *International Geologic Correlation Programme (IGCP) Workshop on Remote Sensing and Mineral Exploration* (Nairobi, Kenya) Will not be held. Previous announcements have been in error (--Editors).

Nov. 30 - Dec. 18 *Landsat Mosaic Workshop* (Fort Clayton, Panama). Presented in Spanish. Contact: Merritt J. Bender, DMA IAGS Cartographic School, APO Miami 34004.

Dec. 16 - 18 *Matching Remote Sensing Technologies and Their Applications: The Past and the Future* (London, England) Contact: Dr. J. A. Allan, School of Oriental and African Studies, Malet Street, London WC1E 7HP, England, telephone: (01) 637-2388.

NOTE: If you are planning to offer a training course in remote sensing, please let us know well in advance so that we can list it in this newsletter. Contact the Chief, Training and Assistance, U.S. Geological Survey, EROS Data Center, Sioux Falls, SD 57198. The telephone numbers for all training-related activities is (605)594-6114.

Landsat Production Statistics

	Dec. '80 MSS	Dec. '80 RBV	Jan. '81 MSS	Jan. '81 RBV	Feb. '81 MSS	Feb. '81 RBV	Mar. '81 MSS	Mar. '81 RBV	Apr. '81 MSS	Apr. '81 RBV	May '81 MSS	May '81 RBV	6-Month Total MSS	6-Month Total RBV
Landsat scenes acquired (satellite acquisitions)*	2,056	1,198	1,214	793	1,637	598	2,229	634	2,253	603	3,312	1,271	12,701	5,097
Landsat scenes (MSS)/Sub-scenes (RBV) received at EDC	3,017	3,825	3,467	3,712	2,394	2,984	2,907	3,000	2,871	2,104	2,070	1,500	16,726	17,125
Average time in days from EDC receipt to archive availability	3.8	9.9	5.6	9.0	8.5	12.9	23.8	34.4	17.6	13.8	2.9	4.2	-	-
Average delivery time in days from receipt of order at EDC to shipment:														
Standard photographic products	15		18		12		11		10		11		-	
Standard digital products	8		11		10		7		8		8		-	
Landsat photographic frames sold	8,930		9,298		11,790		9,677		10,270		10,206		60,171	
Landsat digital scenes sold	356		358		439		400		346		310		2,209	
TOTAL LANDSAT DOLLAR VOLUME	$183,639		$206,238		$228,271		$220,910		$197,616		$178,525		$1,215,199	

*Figures were recently revised as a result of updated information received from NASA.

The Landsat Data Users NOTES is published bi-monthly in order to present information of interest to the user community regarding Landsat products, systems, and related remote sensing developments. There is no subscription charge; individuals and organizations wishing to receive the NOTES should contact the User Services Section, U.S. Geological Survey, EROS Data Center, Sioux Falls, South Dakota 57198, U.S.A., telephone: (605)594-6511.

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
EROS DATA CENTER
SIOUX FALLS, SOUTH DAKOTA 57198

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE, $300

POSTAGE AND FEES PAID
U. S. DEPARTMENT OF THE INTERIOR
INT-413

U.S.MAIL
AIR MAIL